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ABSTRACT

This paper describes the expertise that teachers need to acquire in order to facilitate pupils' self-expression with multimedia. The central idea behind the argument is that multimedia is a creative tool for children and that multimedia learning in the near future is expected to be "Learning by Producing." In such a context of creative learning, pupils need to be recognized as multimedia producers. In order to achieve this situation, teachers need to know how to become learning supporters, curriculum developers, and multimedia coordinators, not just instructors. The necessity for teachers to know the typology and features of multimedia expression, and program evaluation are also discussed with some suggestions. The paper contains the following sections: (1) multimedia production by children, including children as multimedia producers, multi-mode expression, and multimedia literacy; (2) a cross-curricular model of multimedia learning, including isomorphic structure and cross-curricular model, learning unit model, and typical multimedia learning projects (e.g., a CD-ROM encyclopedia, children's television station, and Internet newspaper); (3) facilitating roles of teachers, including learning supporter, curriculum developer, and multimedia coordinator; and (4) specific knowledge about multimedia production, including educational typology of multimedia expression, features of multimedia expression, and creativity and spontaneity necessary for multimedia production. Contains 17 references. (Author/DLS)

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What expertise do teachers require to facilitate pupils' self-expression with multimedia?

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Abstract: This paper describes the expertise that teachers need to acquire in order to facilitate pupils' self-expression with multimedia. The central idea behind the argument is that multimedia is a creative tool for children and that multimedia learning in the near future is expected to be "Learning by Producing". In such a context of creative learning, pupils need to be recognized as multimedia producers. In order to achieve this situation teachers need to know how to become learning supporters, curriculum developers and multimedia coordinators, not just instructors. The necessity for teachers to know the typology of multimedia expression, the features of multimedia expression and program evaluation is also discussed with some suggestions.

1. MULTIMEDIA PRODUCTION BY CHILDREN

Before addressing the aspects of expertise teachers need to acquire in order to facilitate pupils' multimedia expression it would be very important to describe a new image of children learning, namely, children as multimedia producers and also what literacy they are expected to obtain in the process of producing multimedia products.

1.1 Children as multimedia producers

In IT education there has been a slow but steady shift from CAI (computer assisted instruction) to MACP (multimedia assisted communication and production) (Jacobs, 1992; Tanaka, 1995). This means that multimedia is becoming not only a teachers' instructional tool but also a creative tool for children. With the help of many user friendly software packages children are now using multimedia to express their ideas and the information they obtain during their studies. Thus it has become possible for children to experience the role of multimedia producers (Turner and Dipinto, 1992; Kenneth et al., 1994; Tanaka, 1995).

In addition, the collaboration between children is very important because multimedia production requires students to take diverse roles, for example, a writer, a painter, a video editor, an audio mixer, computer programmer and so on (McMahon, 1990; Crook, 1994).

For these reasons teachers need to acquire expertise which is different from traditional methodologies of instruction. These are discussed in the following paragraphs.

1.2 Multi-mode expression

Multi-mode expression is a comprehensive way of self-expression which integrates sound, pictures, videos and text. A good example of this is a musical. A musical incorporates music, singing, scenario, choreography, dancing, stage lighting, stage set and so on. Thus it can be said that multi-mode expression as actualized in a musical or a drama has much similarity with multimedia expression (Trowsdale, 1995). When multi-mode expression is done with multimedia, it results in multimedia products in the form of an electric slide show or an animation.

The potentials of multi-mode expression are very difficult to develop because of the subject barriers in the current school curriculum. But these potentials seems to be important in terms of self-actualization and talent development in a society where a visually persuasive and entertaining presentation is more and more required.

When multimedia production (a typical way of multi-mode expression) is introduced into the classroom, students are expected to acquire multimedia literacy in the process of producing multimedia programs.

1.3 Multimedia literacy

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Table 1 shows a tentative set of multimedia literacy items. These ten literacy items can also become educational objectives in the instructional planning.

Table 1 Ten items of multimedia literacy (Tanaka, 1995)

Multimedia literacy requires an ability in the following items:

1. To understand the characteristics of multimedia, the various modes of information and their combination patterns.
2. To have a basic command of multimedia
3. To select appropriate media and to collect various pieces of information and find the relations between this information using those media
4. To operate data input and information retrieval with a variety of computer peripherals
5. To acquire learning methods and computer literacy through simulated experience with Hypermedia
6. To give a multimedia presentation making good use of the features of each medium
7. To convey multimedia products made with various computer peripherals to others by computer telecommunication
8. To produce a handmade TV program using a video camera, a video editing system, a sound effecter, a sound mixer, a multimedia computer and so on
9. To make presentation materials with an interactive video system or Hypermedia
10. To create multimedia products which integrate knowledge, images and emotions

2. CROSS-CURRICULAR MODEL OF MULTIMEDIA LEARNING

In most in-service training courses for the IT use offered by the local boards of education the main topics would tend to focus technological aspects of IT education more than pedagogical considerations for it. However, considering that IT coordinators are now being recruited in several technologically advanced countries like the United States, the United Kingdom and Japan, the classroom teachers' role could be changed from that of a technician to that of a pedagogical facilitator in the process of developing the IT curriculum and learning projects (North, 1991; Owston, 1995).

2.1 Isomorphic structure and cross-curricular model

Recently several books advocating cross-curricular practice have been published responding to the National Curriculum, which suggests five cross-curricular topics in the school curriculum (Webb, 1996; Radnor, 1994; Morrison, 1994). Before this Anderson (1991) had pointed out the importance of IT education as a cross-curricular element in terms of the availability of IT to all pupils and the possibility of improving the quality of learning through enhancing common information skills.

Similarly Fox (1996) discussed some effective ways to incorporate media education (one form of IT education) as cross-curricular catalyst into the school curriculum. Also analyzing twenty three case studies on innovative educational projects in science, mathematics and technology Black and Atkin (1996) reported that there had been some arguments for the curriculum connection in their discussion of summarizing their analysis. Thus the need to promote IT education as a cross-curricular theme has been gradually recognized.

However there has been little literature so far which discussed the potential similarity between multimedia learning and cross-curricular activities. In figure 1 such a similarity between the two is illustrated.

The similarity stems from the feature of educational multi-mode expression which is a common activity to both multimedia learning and cross-curricular activities because multi-mode expression needs both contents to include and means to produce with. Such a combination of the contents and means of multi-mode expression is a typical feature of cross-curricular activities. Thus when pupils perform multimedia production, a cross-curricular learning context could be helpful to them through providing pupils with both the aspects of expression which are integral elements of multimedia production.

This cross-curricular model illustrating the isomorphic structure of multi-mode expression would also be useful to teachers to develop an integrated learning unit for pupils' multimedia production through combining different subjects (Figure1).

2.2 Learning unit model

In order to foster the quality of learning activities and multimedia products, a guideline for the sequence of productive activities is necessary. After examining the learning unit models adopted in the two classroom

implementations (Tanaka, 1995), several common features were found and a cross-curricular unit model was constructed according to these features.

The five common features are as follows:

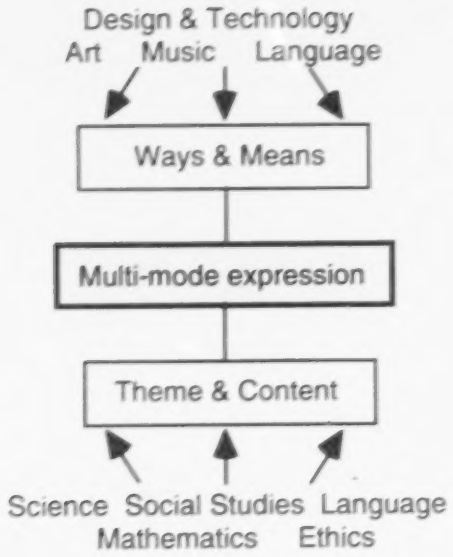

Figure 1 Cross-curricular model for multi-mode expression (Tanaka, 1995).

1. The model includes a comprehensive sequence of activities, i.e. an appreciation of various multimedia products, image construction of multimedia products, image enrichment by analysis of previous products and research outcomes, creation of scenario and design blueprint, production of parts, assembly of parts and a final stage, i.e. presentation, performance and appreciation.
2. At the fifth stage 'Production of parts' various expression modes, e.g. sounds, pictures, stories are integrated to produce moving images.
3. The first activity stage 'Appreciation of various multimedia products' simulates students' interest and the third stage 'Image enrichment' provides them with good examples of multi-mode expression.
4. The third stage is inserted to enrich the motif or theme with empirical data for students.
5. This model accommodates collaborative production and role assignment.

Figure 2 illustrates a cross-curricular learning unit model developed in this process. Naturally the model is based on the idea of combining the investigation phase which supports the contents of expression and also the production phase which supports the means of expression. This idea of combination is not original in the recent literature of multimedia learning, but it was already discussed by Innocenti and Ferraris (1988), who made a combination model of the instructional use of a database by showing the necessary linkage between the database creation phase and the investigation phase.

2.3 Typical multimedia learning projects

The provision of pedagogical ideas about typical multimedia projects would make it easier for class teachers to acquire expertise in developing an integrated learning unit with cross-curricular activities for multimedia expression. Here are some examples of project ideas which could function as scaffolding for the effective curriculum development.

Let's produce a CD-ROM encyclopedia

This project could include both investigation about the topics which pupils have in mind and multimedia expression with CD-ROM facilities. These topics might be related to one or some of the several subjects like language, social studies, science, music and art. Pupils' multimedia production would result in a variety of multimedia CD-ROM titles like a multimedia slide-show, a home town database, a botanical database and a computer art gallery respectively.

Let's open our children's TV station

As described earlier in this paper the production and delivery of TV programs are a typical cross-curricular multimedia work. When children select a drama program as a production task, the combination of a language class (in charge of producing scenario), a social studies class (ethics and related laws of broadcasting) and a art and design class (multimedia production) would be very useful. In contrast when they select a news program, the integration could be between language, social studies, art and design, science, etc.

Let's produce an Internet newspaper on the WWW

Nowadays multimedia production in this information society is rapidly expanding into an international telecommunication world. A tremendous amount of information is being exchanged through Internet. Therefore it could be considered as meaningful for pupils to experience cross-curricular activities related to multimedia newspaper production and to obtain communication skills which could be applied to their future career or everyday community services.

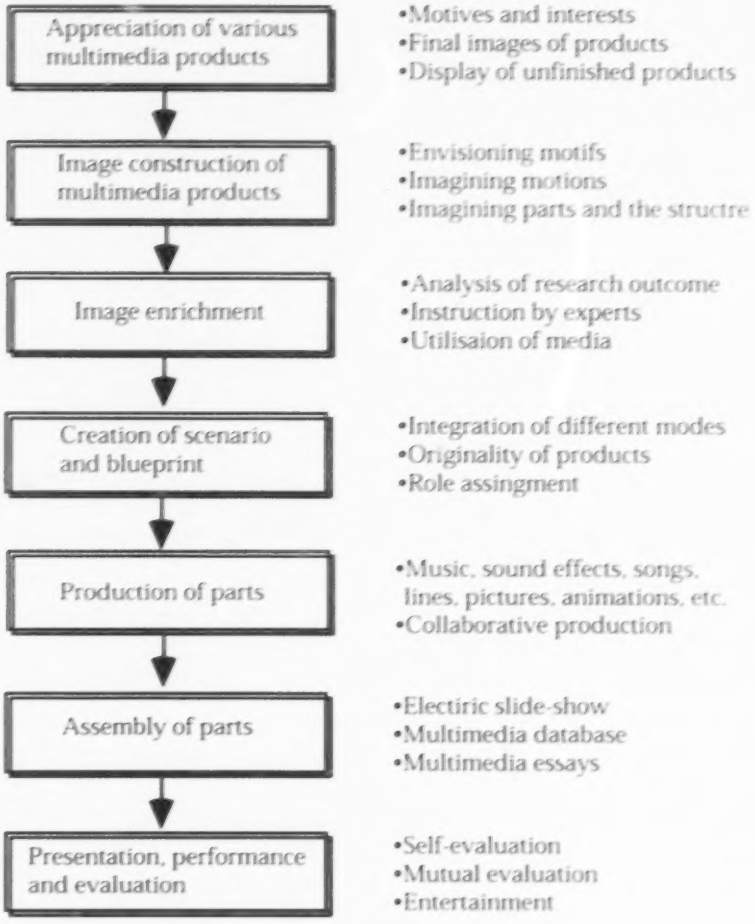

Figure 2 Learning unit model for multi-mode expression

3. FACILITATING ROLES OF TEACHERS

Pedagogical considerations at the level of curriculum development and project construction have been discussed so far. Then focusing on these two points specifically from the aspect of teachers' roles will be another important task to clarify what expertise teaches require.

3.1 Learning supporter

Considering that multimedia is not only a teacher's tool for efficient instruction but also a learner's tool for creative learning, it is important for teachers to note that their role is no longer that of an instructor but more that of a supporter for learners.

The objectives of a teacher as a supporter could be categorized into the following ten points.

1. To praise what pupils have done well in order to activate their motivation towards further learning
2. To provide them with good examples of products and research findings
3. To offer alternatives for the learning themes and the methodologies
4. To provide pupils with opportunities to utilize a variety of learning materials and multimedia
5. To prepare open space as a flexible learning environment in which to foster diverse activities
6. To prepare learning aids such as a guidebook, an activity sheet, an orientation leaflet or a promotion video
7. To care for pupils' learning difficulties and answer their questions
8. To make appointments with institutions and human resources outside the school to enrich pupils with as much direct experience as possible
9. To describe the sequence of learning activities
10. To give advice which fosters a collaborative atmosphere in the working group

3.2 Curriculum developer

Some teachers in practice might think that it would be a good idea to wait for new curriculum resources to be developed by researchers and publishers. But what is more valuable for professional development of teachers is that they experience a workshop to develop curriculum by themselves. It will inevitably profits their creativity and curriculum knowledge on IT education. The role of a curriculum developer facilitating pupils' multimedia expression would include the three aspects described below.

1. Curriculum development for basic training of media literacy
2. Development of a cross-curricular learning unit
3. Emergent curriculum development

3.3 Multimedia coordinator

In multimedia learning it is also important for teachers to equip pupils' learning environments with multimedia rather than just to use the media for the delivery of information to their pupils. The idea behind this is that pupils should be encouraged to take advantage of multimedia on their own. What is indispensable in relation to this idea is a 'media-mix' approach which encourages pupils to think of and put into practice meaningful combinations of different types of media. Typical factors which teachers would need to consider are as follows:

1. Preparing media-corners space
2. Setting up a multimedia studio
3. Offering opportunities to use an intelligent library
4. Providing cooperative keypals and human resources for networking

But it is always difficult for pupils to find people who cooperate on a regular basis. Thus teachers will have to play another important role in making connections with keypals on the net or local volunteers in the school district. After establishing the connections, it is again the role of the teachers to act as a learning supporter as described above in order to encourage collaborative learning.

4. SPECIFIC KNOWLEDGE ABOUT MULTIMEDIA PRODUCTION

Furthermore it is another requirement for teachers to have some specific knowledge about multimedia production. With this knowledge teachers could guide and evaluate pupils' multimedia products and presentations.

4.1 Educational typology of multimedia expression

At first teachers need to know what types of multimedia expression can be done by their pupils. Typical multimedia expressions by pupils would be categorized as follows:

1. Multimedia production
2. Multimedia presentation
3. Multimedia debate
4. Multimedia telecommunication

4.2 Features of multimedia expression

Teachers need to have an overall understanding of the features of multimedia expression to facilitate their pupils understanding. This understanding should cover the seven points described below.

1. Expressing how you have reflected your personality and the originality of your investigation on the program
2. Combining various modes of information, i.e. multimedia materials
3. Adding interactivity to the program
4. Designing an information structure which is easy for users to understand
5. Designing an interface which facilitates information retrieval
6. Combining logical expression and emotional expression
7. Reflecting the merits of different roles within a group to achieve collaborative production

4.3 Creativity and spontaneity necessary for multimedia production

In order for teachers to evaluate pupils' productive activities with multimedia several symptoms of creativity and spontaneity which pupils would show during their multimedia production will be helpful.

1. Sharing of different skills needed in multimedia production
2. Construction of a role structure and role assignment
3. Needs assessment aimed at the audience
4. Collaborative information gathering beyond the National Curriculum
5. Mutual teaching and learning

5. Conclusion

The forms of expertise identified above, to be included as a knowledge base in in-service training program, is necessary because pedagogical knowledge relating to the educational use of information technology is as necessary as technical knowledge and skills. The subsequent research tasks needed will be to develop effective training methodologies to make this knowledge available for practice. In training workshops it will be important that this knowledge base be utilized with a great deal of flexibility so that teachers can adjust the content to meet the needs of each classroom context. In order achieve this, a comparative study methods using several cases of implementation would be one effective way of identifying and producing possible means of teacher training.

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